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P SIMULTANEOUS OCCURRENCE AT CONJUGATE POINTS
OF CLASS Pc-1 MICROPULSATION BURSTS

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SIMULTANEOUS OCCURRENCE AT CONJUGATE POINTS
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SUMMARY

New data are presented on the characteristic properties of oscillation intervals decreasing by period and representing the conjunction of Pc-1 and Pi-1 types of oscillations. It is assumed that in this case a simultaneous excitation of two hydromagnetic waves of different mode takes place, these propagating in opposite directions. This is linked to the various events taking place in the upper atmosphere of the Earth.

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The registration of vast variations of the magnetic field conducted at magneto-conjugate points of Kerguelen (France) and Sorga (SSSR) allowed us to conduct a detailed investigation of the highest-frequency part of the spectrum of these variations. It is referred here to pearl-type Pc-1 and to irregular Pi-1 oscillations). The first results of these investigations, mainly devoted to the study of the properties of regular Pc-1 series, were published in [1]. In the present paper we present new data on the properties of characteristic intervals of oscillations decreasing by the period and representing the conjunction of both types of oscillations, Pc-1 and Pi-1 [2]. These characteristic disturbances are well known in literature as storm pulsations [3], solar whistlers [4] and garglers [5]. The conjunctions of these oscillations constitute the basic element of magnetic storms' microstructure and are indicators of perturbation occurrence in the ionosphere, of the development of active forms of aurorae and of sharp intensity variations in the radiation belts [2]. This phenomenon was first simultaneously registered at conjugate points of the sub-auroral zone with the aid of installations described by Stefant [6] and Baranskiy [7].

The most typical such cases for the conjugate regions Sorga-Kerguelen in the course of a whole year (February 1964 to February 1965) were those of 12 and 20 February, 1 and 18 April, 10 June, 15 and 28 September, 19 October and 16 December 1964. Outlined in 1965 were the cases of 23 February and 3 March. Analysis of these perturbations was conducted by the sonograms (time-frequency dependence) and by standard field registrations (amplitude-time) with a rate of deployment from 60 to 600 mm per minute and a sensitivity $\sim 10^{-8}$ oe.

* /ODNOVREMENNOYE VOZNIKNOVENIYE V SOPRYAZHENNYKH TOCHIKAKH VSPLESKOV MIKROPUL'SATSIY KLASSA Pc-1.

Morphology of the Phenomenon.

The interval of oscillations decreasing by period has a duration varying from 30 to 90 minutes as an average. It has a characteristic tendency to 2 - 3 time recurrence one after the other. The sonograms obtained allowed us to trace for the first time the identical character of this phenomenon's development in conjugate points in the frequency - time representation, and to ascertain a series of new properties. As the interval of these oscillations develops, the width of the noise band corresponding to irregular oscillations widens and simultaneously increases in frequency. A raised noise "tail" is observed at the end of the phenomenon and is characteristic of it. The beginning and the end of the intense noise band develop concomitantly at both conjugate points. There are outlined in this noise band separate structured elements, as a rule rising by the frequency (see Fig.1), which correspond to separate bursts of Pc-1 oscillations observed in standard registrations (amplitude-time).

Results.

Shift in phase between the time of their occurrence at conjugate points and the polarization of the components of their oscillations were studied for the structured elements.

The coincidence in time of a series of structured elements of the above type in conjugate points was the unexpected result of sonogram comparison. The simultaneity of Pc-1 oscillation bursts' excitation, corresponding to structured elements in the sonogram, was also traced by direct amplitude-time registrations (Fig.2).

The analysis of polarization of these oscillations also contributed a new and unexpected result, and namely, that the direction of polarization ellipse rotation for an observer looking toward the Earth along the line of force, was identical in both conjugate points (contrary to the opposite direction usually observed of Pc-1 series [8]). Therefore, separate Pc-1 oscillation bursts (separate pearls in standard time-amplitude registrations), occurring during the interval of characteristic oscillations decreasing by period, have a polarization differing from analogous bursts inside Pc-1 series, and do not reveal any phase shift in magneto-conjugate points, otherwise typical of such series. It should be noted that Pc-1 series occur mainly in periods of low magnetic activity, whereas the intervals in question are characteristic mainly of the main phase of the storms.

The results obtained allow us to express the assumption that the character of Pc-1 oscillation bursts' excitation in the magnetosphere is different for the cases of these types of oscillations and the Pc-1 series. In the case of the former there apparently takes place an excitation occurring simultaneously in two types of hydromagnetic waves of different mode, which propagate in opposite directions. In the case of structured Pc-1 series hydromagnetic waves of a single specific mode emerge and then propagate from one hemisphere to the other along the line of force.

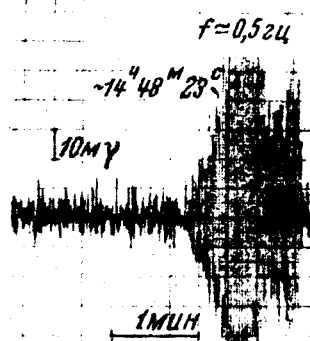
Kerguelen, 3 March 1965

Кергелен 3.III.1965



Fig.1 Sonogram of the Kerguelen registration of 3 March 1965. Seen in it are the basic characteristics of the oscillation interval decreasing by period. The noise expands in time by the frequency and ends with a "tail" increasing by frequency. Superimposed on the general noise in disorderly fashion are separate structural elements

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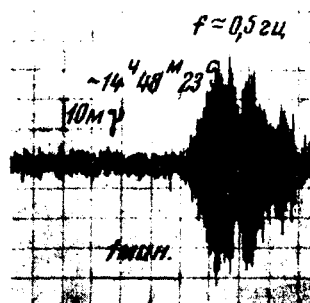


Fig.2. Example of simultaneous excitation at time of Pc-1 oscillation burst decreasing by period. (structured element) in both conjugate points (14 h. 48 min. 23 s. GMT)

It is interesting to note that the unquestionable link of the registered oscillations with a series of events in the upper atmosphere, and namely, with intensity variations in the radiation belts [9], emergence of sporadic type-E_{sr}-layers, critical frequency decrease in the F2-layer of the ionosphere, bursts of X-radiation in the stratosphere and the occurrence of active forms of aurorae [10], is observed only at simultaneous excitation of two waves of different mode.

The results of detailed investigations of these relationships will be published in a separate work.

*** THE END ***

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